

Detailed CREiGS 11-week Online Curriculum

Learning Objective	Title	Topics covered
Weeks 1-2: Introduction to Genetics and Genomics Research		
Provide an introduction to the key areas of human genetics, genomics and genetic variation.	Principles of human population genetics	Architecture of the human genome and genetic variation; Heterogeneity and pleiotropy; Modes of inheritance; Epigenetics and imprinting
	Fundamentals of genetic epidemiology	Designs and study types in genetic epidemiology; Gene discovery; Types of genetic and genomic data; Segregation, linkage and association analyses
Weeks 3-6: Quantitative Methods for the Analysis of Genetics and Genomics Data		
Gain the foundational skills in statistics and genetic and genomic data analysis.	Fundamentals of statistics	Introduction to probability and statistical inference; Hypothesis testing; Simple linear regression; Categorical data analysis
	Introduction to statistical genetics	Hardy Weinberg Equilibrium; Introduction to GWAS; Analysis of rare variants; Epigenome-wide association analysis
Learn the fundamentals of R programming.	Introduction to R programming	Basic R programming skills, including data manipulation; Data Management, Data handling, Data Visualization.
Learn how to use common genomics packages in R.	Genomic data analysis in R (Bioconductor, GWAS)	Introduction to Bioconductor, processing SNP data in R, GWAS in R.

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Learning Objective	Title	Topics covered
Weeks 7-9: Advanced Topics and Bioinformatics		
Gain exposure to commonly applied machine learning techniques for genomic data analysis.	Introduction to machine learning	Clustering; PCA; Supervised and unsupervised learning; Machine learning regression techniques;
Gain exposure to popular types of genomics data analysis and computational tools.	Analysis of single cell RNA-seq data	Advanced genomics data types; Data management skills; Analysis methods; Bioinformatics tools
	NGS applications for microbiome data	
Weeks 10-11: Engaging Diverse Communities in Genetics and Genomics Research		
Explore best practices for engaging diverse communities in genetics and genomics research.	Integrating Genetics and Genomics in Health Disparities Research	Educating and engaging community stakeholders; Effective recruitment strategies for recruiting diverse populations; Discussion of underlying rationale, overarching research questions, and key findings to date from the AC3 and opportunities for collaboration.
Gain exposure to methodologic strategies for evaluating samples with ancestry admixture in genomic association studies.	Statistical Methods for Diverse, Admixed Populations	Individual ancestry estimation; Relatedness estimation; Association testing; Heritability Estimation.